2- BIA
1- Carlsbad

ENVIRONMENTAL ANALYSIS

PROPOSED
PW2-PW3 MINE PROJECT
THE ANACONDA COMPANY
NEW MEXICO OPERATIONS
URANIUM DIVISION

PUEBLO OF LAGUNA
JACKPILE MINING LEASE
LAGUNA INDIAN RESERVATION
VALENCIA COUNTY, NEW MEXICO

U. S. GEOLOGICAL SURVEY
CONSERVATION DIVISION
P. O. BOX 1716
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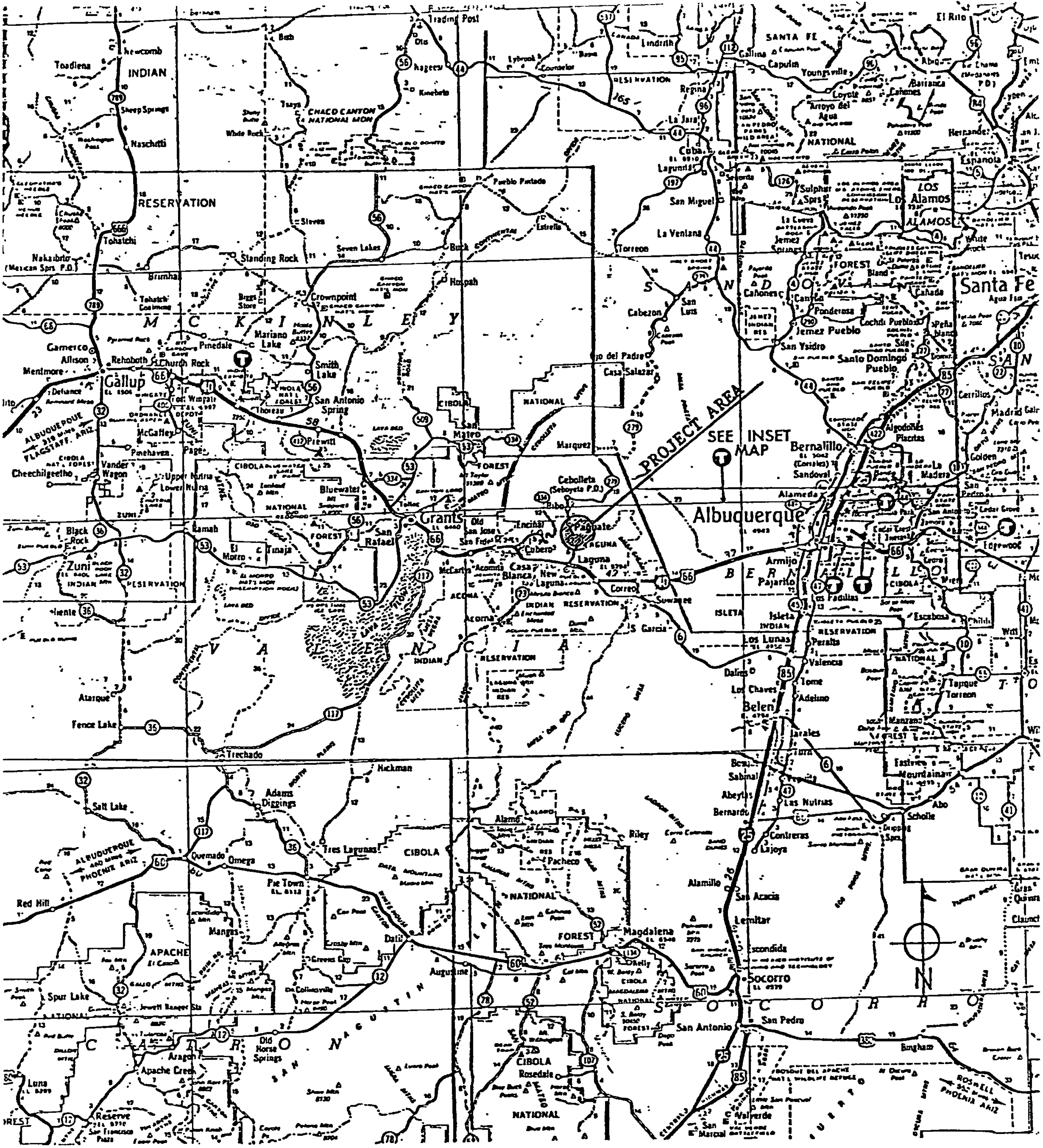
I. DESCRIPTION OF THE PROPOSED ACTION

A. Introduction

The proposed action was submitted January 5, 1977, to the Conservation Division of the U. S. Geological Survey under the provisions of 25 CFR Part 177 and 30 CFR Part 231. It consists of a mining and reclamation plan in which The Anaconda Company proposes to develop a small scram type mining operation, the PW2-PW3 Mine Project, to extract uranium ore on the fringes of its existing North Paguate Pit. The proposed project would be located within the boundaries of the Jackpile Mining Lease which occupies approximately 5000 acres of the Laguna Indian Reservation near Paguate in Valencia County, New Mexico (Map A). The operation would be situated within Section 33, Township 11 North, Range 5 West, N.M.P.M., of the lease (Map B).

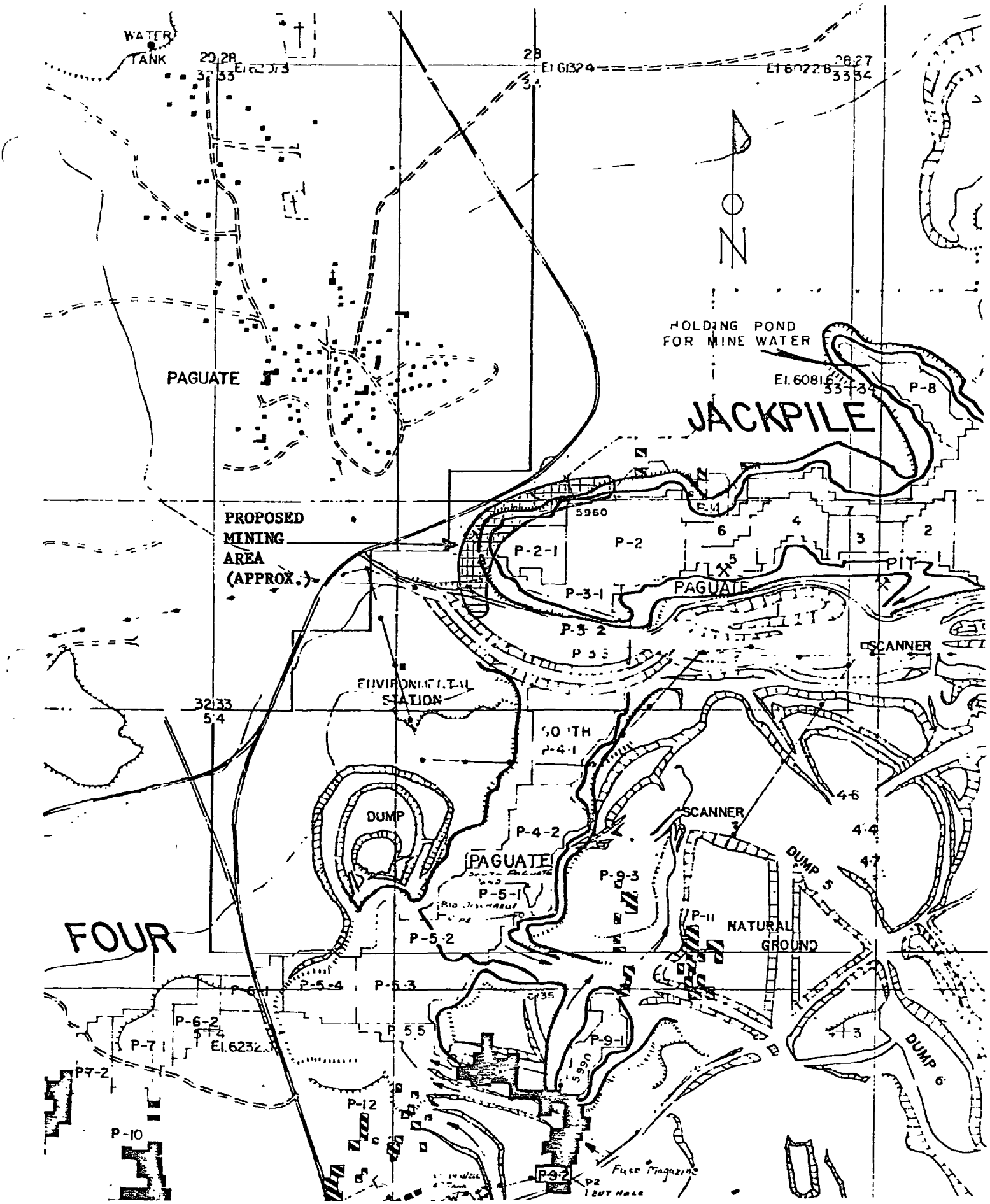
The Jackpile Mining Lease, also known as Laguna Lease #1, was issued May 7, 1952, by the Pueblo of Laguna to The Anaconda Company. It contains the lessee's operating Jackpile and Paguate Pits (open-pit mines), and uranium ore has been mined from the lease since 1952. The lease also contains the abandoned H-1 Mine, a small adit mine, where uranium mining was completed by the company in 1975.

Anaconda also operates Laguna Lease #4 which occupies about 2600 acres southwest of, and adjacent to, the Jackpile Lease. This lease was issued July 30, 1963, and contains the company's producing P-10 underground mining operations (Map B) as well as some surface facilities for the Paguage Pit. July 26, 1976, Anaconda acquired Laguna Lease #6 which occupies the south one-half (320 acres) of Section 25, T 11 N., R 5 W., N.M.P.M., northwest of and adjacent to the Jackpile Lease. The company had previously held this lease and conducted some exploration work, but no operations are currently in progress.



MAP A

Project Area Location Map
(Texaco Touring Map of New Mexico, 1957)



MAP B

Jackpile Mining Lease-Section 33, T11N, R5W, NMPM
(The Anaconda Company, 1976)

The Pueblo of Laguna owns all of the surface and mineral rights within the leased acreage. According to the lease terms, Anaconda has the right to "use as much of the surface as is necessary in the extraction and removal of the minerals from the leased land." In addition, by an agreement of June 10, 1974, all of the company's leases have been unitized, ie., "exploration, development and production on any one or more of such leases shall be deemed to satisfy any and all exploration, development and production requirements on all leases between the parties." It was also agreed that that beginning January 1, 1976, ores from the various involved leases could be commingled prior to sampling or assaying.

E. Surface and Underground Operations

The ore deposits involved in the PW2-PW3 Mine Project are on the fringes of more concentrated ore zones which were mined by open-pit mining methods. However, these remnant deposits are too close to State Highway 279 and the village of Paguate to allow open-pit mining. The proposed action would make it possible to extract the deposits in an economically and environmentally sound manner. Anaconda originally planned to commence operations February 1, 1977, but now would probably begin upon approval of the plan. The expected life of the project would be between 1 1/2 to 2 years from the starting date.

The proposed mining project is located on the northwestern edge of the mined out North Paguate Pit (Map E). Existing open-pit roads would provide access to the mine portal and surface facilities. Buildings for housing offices, supplies, maintenance facilities, fuels and lubricants would be temporary type structures and would be removed at the end of the operation. Portable equipment would be used to generate electricity at the site. Approximately 16,500 tons of waste material would be removed from the mine during haulage drift and stope development. This material would be placed

in low areas near the portal to prepare a temporary ore storage pad and to help backfill the mined-out pit area.

Access to the underground ore deposits themselves would be gained through an adit which would be collared at the pit edge (Photo A) as shown by the map in the mining plan (Appendix I). From the collar, the adit would be driven downgrade about 460 feet west and north to a proposed sump location. The elevation of the adit would be at or below that of the ore deposits. From the sump, the adit would continue upgrade to the north and east for approximately 1300 feet. Breakthroughs would be driven to the open-pit area in three locations for ventilation with fans providing air flow as required. About 150 feet from the adit collar, a turnout drift would be driven downgrade to the south for about 200 feet to a second sump. This drift would then continue south an additional 450 feet, upgrade, just below the ore deposits.

Extraction of the ore deposits would be accomplished using primarily modified room-and-pillar mining with sublevel haulage. Some of the deposits, however, would be mined directly from the haulage drift. Conventional drilling and blasting methods combined with an Alpine Miner, loaders and underground trucks would be utilized. Rock bolts, wire mesh, steel and/or timber sets, stulls and cribbing would be used as necessary to maintain ground control.

It is anticipated that ground water would flow into the mine workings at an initial rate of 30 to 50 gallons per minute (gpm), decreasing to about 10-15 gpm as mining progressed. This water would be pumped from the mine via pipeline to existing retention ponds in the open-pit. The ponds are about 1200 feet east of the proposed portal location (Map B), and water is periodically withdrawn from them and used to suppress dust on the open-pit haulage roads.

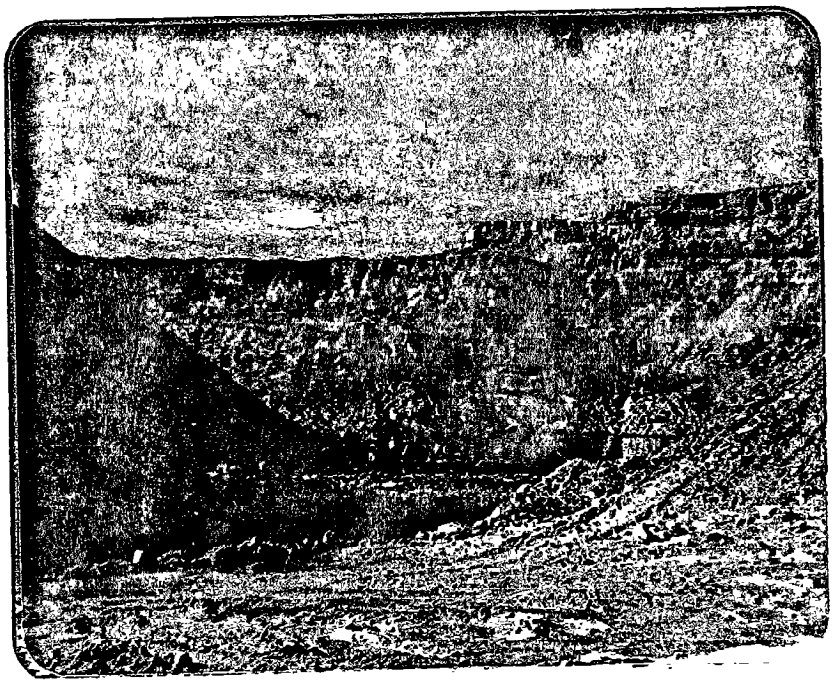


Photo A

Approximate location of PW2-PW3 portal in mined-out North Paguate Pit; water is ground water seeping into pit from benches and some surface runoff from snowmelt

The PW2-PW3 Mine would be very similar to the company's P-9-2, P-9-3 and P-11 adit projects (Map B) which are shown in Photos B and C. The P-9-2 Mine, located within Lease #4, was approved in February 1974. It was developed from three separate adits, and mining was suspended in November 1974, pending further exploration. The P-9-3 and P-11 Mines are located on the boundary between Leases #1 and #4 and were approved in November 1975, as a supplement to the plan for the P-9-2. The adits were driven but development was postponed pending further evaluation of the feasibility of using open-pit methods to mine the ore. Anaconda is now pumping water from the adits and plans to commence development in the near future.

Surface drilling in the PW2-PW3 area indicates ore reserves of about 36,500 tons in-place with an average grade of about 0.27% uranium oxide (U_3O_8). It is anticipated that actual ore recovery during mining would be less than this reserve estimate due to adverse ground conditions near the pit perimeter.

Ore from the PW2-PW3 Mine would be transported and processed in the same manner as the ore from the currently producing open-pit and underground operations. From the temporary storage pad at the portal site, the ore would be trucked to various stockpiles according to its grade. It then would be periodically removed from these stockpiles and trucked over existing haulage roads to the company's railhead south of the Jackpile Pit. At the railhead, the ore would be crushed and loaded into 100-ton railroad cars which are transported by the Atchinson, Topeka and Santa Fe Railroad (ATSF).

Due to its moisture content, all of the company's underground ore is presently toll milled at Kerr-McGee Corporation's processing facility at Ambrosia Lake, about 18 miles north of Grants, New Mexico. However, it is possible that the ore could be processed at the company's Bluewater Mill

Photo B

P-9-2 Adit Mine Project

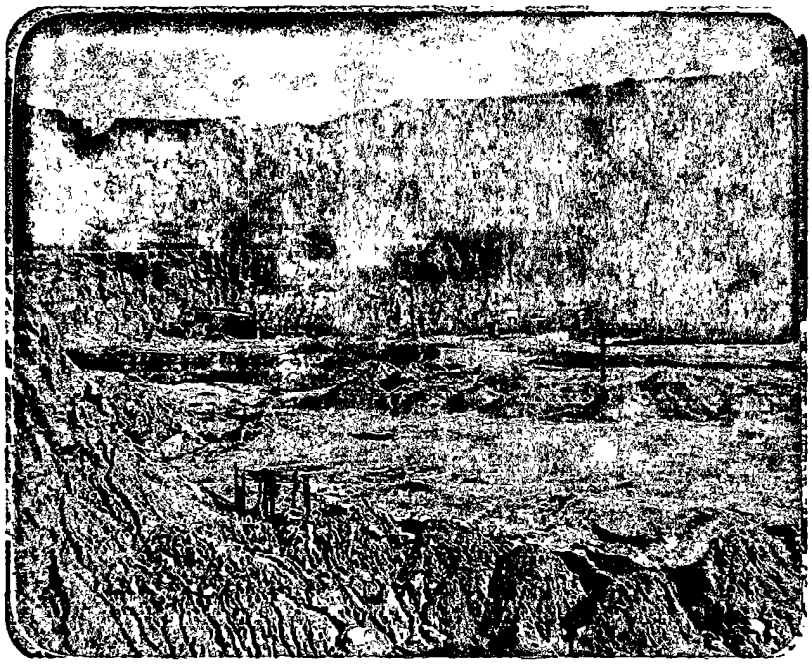


Photo C

P-9-3 and P-11 Adit Mine Projects

which is about 8 miles west of Grants. This mill currently has a capacity for 3500 tons of ore per day but is being modified to double its capacity and allow the milling of lower grade ore. Both of these mills utilize hydrometallurgical processes to recover and concentrate the natural uranium oxide in the crude ore into a dried precipitate known as yellowcake or U_3O_8. The yellowcake is packaged in sealed 55-gallon steel drums to be sold to utility companies for further processing and ultimate use in nuclear powered electric generators.

The proposed mine would operate under the Federal Metal and Nonmetallic Mine Safety Act as well as other applicable state and federal rules and regulations and Anaconda's own safety program. Periodic inspections by authorized personnel from the New Mexico State Mine Inspector and the Mining Enforcement and Safety Administration (MESA) would assure compliance with the applicable regulations and standards. The New Mexico State Mine Inspector currently has an agreement with MESA whereby inspections are made jointly by members of both agencies and whereby New Mexico adheres to the federal rules and regulations. The ventilation breakthroughs would provide three additional exists from the mine in case of an emergency mine evacuation.

The PW2-PW3 mining operations would be completed in about 2 years from the starting date. At that time, all mine openings would be sealed in accordance with the applicable standards, and all surface structures and equipment would be removed. The mined-out pit area would then be backfilled almost to the existing pit crest with overburden and/or waste rock from the open-pit operations. This backfilling is essential for reclamation of the open-pit workings, and it is necessary to mine the PW2-PW3 area now so that the backfilling can be performed in an orderly and economical manner without losing the valuable ore deposits involved. The backfilled area would sub-

sequently be revegetated, and it is anticipated that the underground operation would not be apparent within 2 years after the conclusion of mining activities.

C. Related Actions

The proposed action was submitted January 17, 1977, to the Pueblo of Laguna and the Southern Pueblos Agency of the BIA for their review, recommendations and/or approval. Their respective comments are included in Appendix II. No actions by other state or federal agencies are required. The prescribed posting of public notices of the proposed action (Appendix III) has resulted in no inquiries, comments or evidence of controversy.

The Anaconda Company has submitted two other proposed actions involving its Jackpile-Paguate uranium mining operations to the USGS for approval. The mining and reclamation plan for the P-15 and P-17 Mines was submitted March 18, 1976. The plan provides for two small underground mines (500 - 700 tons per day each) to be developed through two separate vertical shafts within Lease #4. An environmental analysis of the plan has been prepared, and the plan awaits the approval of the Pueblo of Laguna and the BIA.

February 25, 1977, Anaconda submitted a comprehensive mining and reclamation plan covering the entire Jackpile-Paguate mining operation, both open-pit and underground, from the present until termination. An environmental analysis of the plan will be prepared in order to assess the cumulative impacts of the operation. This analysis would provide a better opportunity to consider and assess any cumulative impacts from the proposed PW2-PW3 Mine Project.

Another mining and reclamation plan involving Pueblo of Laguna lands was submitted July 15, 1976, by Continental Oil Company. This plan provides for a relatively large underground uranium mine (1000 tons per day) to be located within a portion of the Laguna Indian Reservation known as the

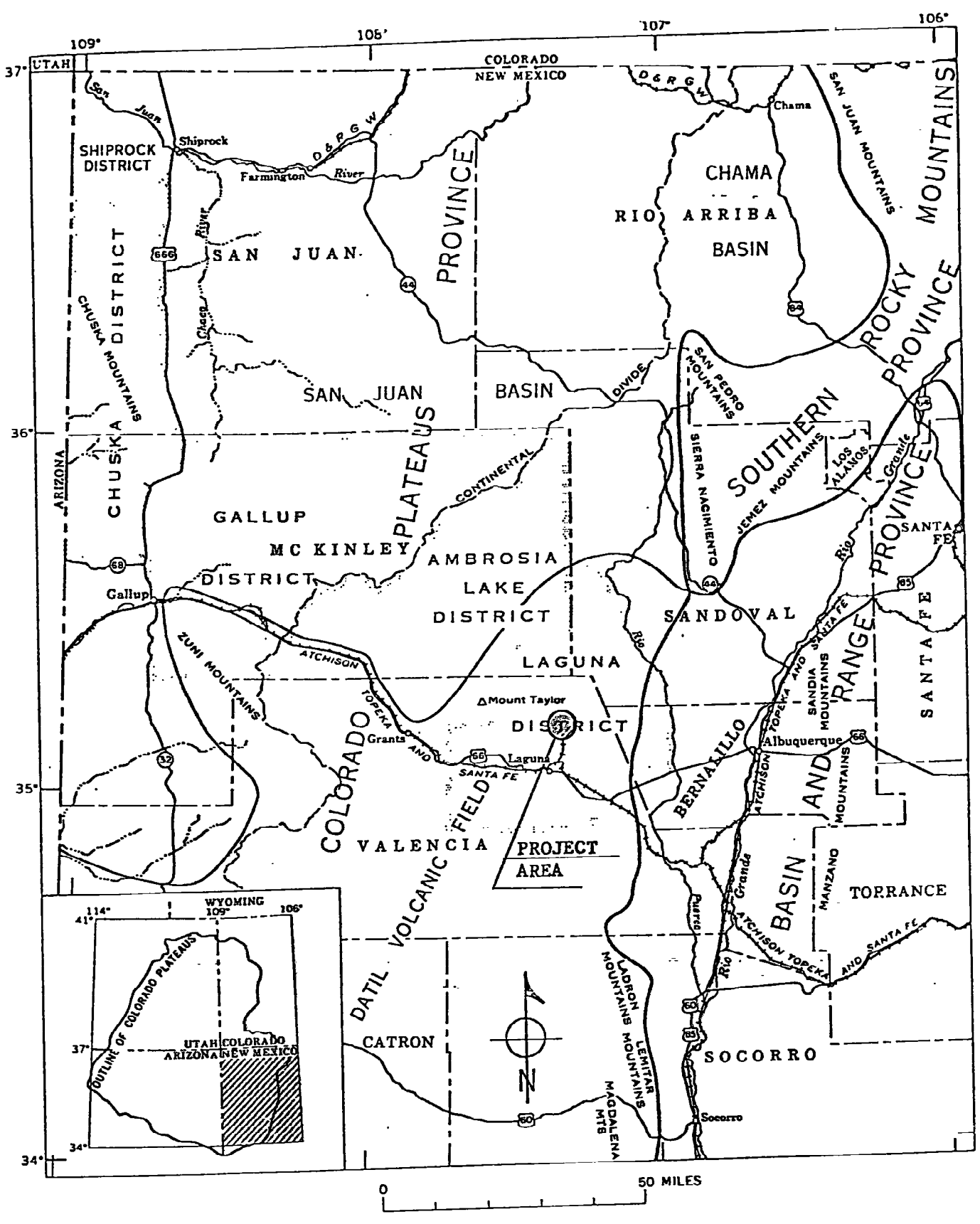
Bernabe M. Montaño Grant, about 25 miles northeast of Anaconda's mining operations. An environmental analysis of the plan has been prepared, and the plan awaits approval by the Pueblo of Laguna and the BIA.

II. ENVIRONMENTAL CONSIDERATIONS OF THE PROPOSED ACTION

A. Geology

The Anaconda Company's Jackpile-Paguate mining operations lie almost in the center of the Laguna Uranium Mining District which is an area of about 535 square miles on the east side of the Colorado Plateaus physiographic province (Map C) (Moench and Schlee, 1967, p. 3). Structurally, this area is in the southeastern part of the San Juan Basin, a broad topographic depression characterized by broad open valleys and mesas and local deeply incised drainage features. The Mount Taylor volcanic field is located to the north and west of the area (Dinwiddie, 1963, p. 217).

The Laguna District is located in mesa country that is typical of much of the Colorado Plateaus province. Mesa Chivato, the largest and highest mesa, rises to an altitude of 8,000 feet above sea level on the northwest side of the district with its flat lava top covering about 400 square miles. Mesa Gigante rises to an altitude of more than 6,500 feet on the southeastern side, and the similar but much smaller Mesa Prieta is located on the northeastern side about 14 miles east of Mesa Chivato (Map A). Between these prominent landmarks are smaller mesas and benches. The northeastern part of the district is characterized by low mesa and bench topography, and in this area as well as farther south, the land surface is pierced by several volcanic necks that rise abruptly to as much as 1,000 feet above the surrounding landscape (Moench and Schlee, 1967, pp.3-4). From the southern part of Mesa Chivato, the roughly conical Mount Taylor,



MAP C

Physiographic Map of Northwestern New Mexico
(Hilpert, 1969, p. 3)

a large inactive volcano, rises more than 11,300 feet above sea level and more than 5,000 feet above the valley of the Rio San Jose to the south (Hunt, 1936, p. 36).

The perennial Rio San Jose is the main drainage in the Laguna District. It drops from an elevation of about 5,900 to less than 5,600 feet from west to east, and it is entrenched 20 feet or more over most of its length. A few miles southeast of the district, it joins the Rio Puerco, a tributary of the Rio Grande (Moench and Schlee, 1967, p. 4) which flows continuously only during the wet season. The Rio Puerco drains the west flank of the Nacimiento Mountains forming the east boundary of the district (Hunt, 1936, p. 37).

Several arroyos join the Rio San Jose from the north and south, but ordinarily most of them flow only after summer thunderstorms. The largest of these arroyos are the perennial Rio Paguate and the intermittent Arroyo Conchas which drain the area to the north of the Rio San Jose and the Arroyo Colorado which drains the broad valley to the south. The Arroyo Salado drains the northeast corner of the district and joins the Rio Puerco to the east (Moench and Schlee, 1967, p. 4). All the main streams and tributaries are entrenched into arroyos cut in the alluvial fill of the valleys. These arroyos carry very large quantities of water immediately after heavy precipitation, and occasionally the waters rise over the banks and spread out as sheet floods (Hunt, 1936, p. 37).

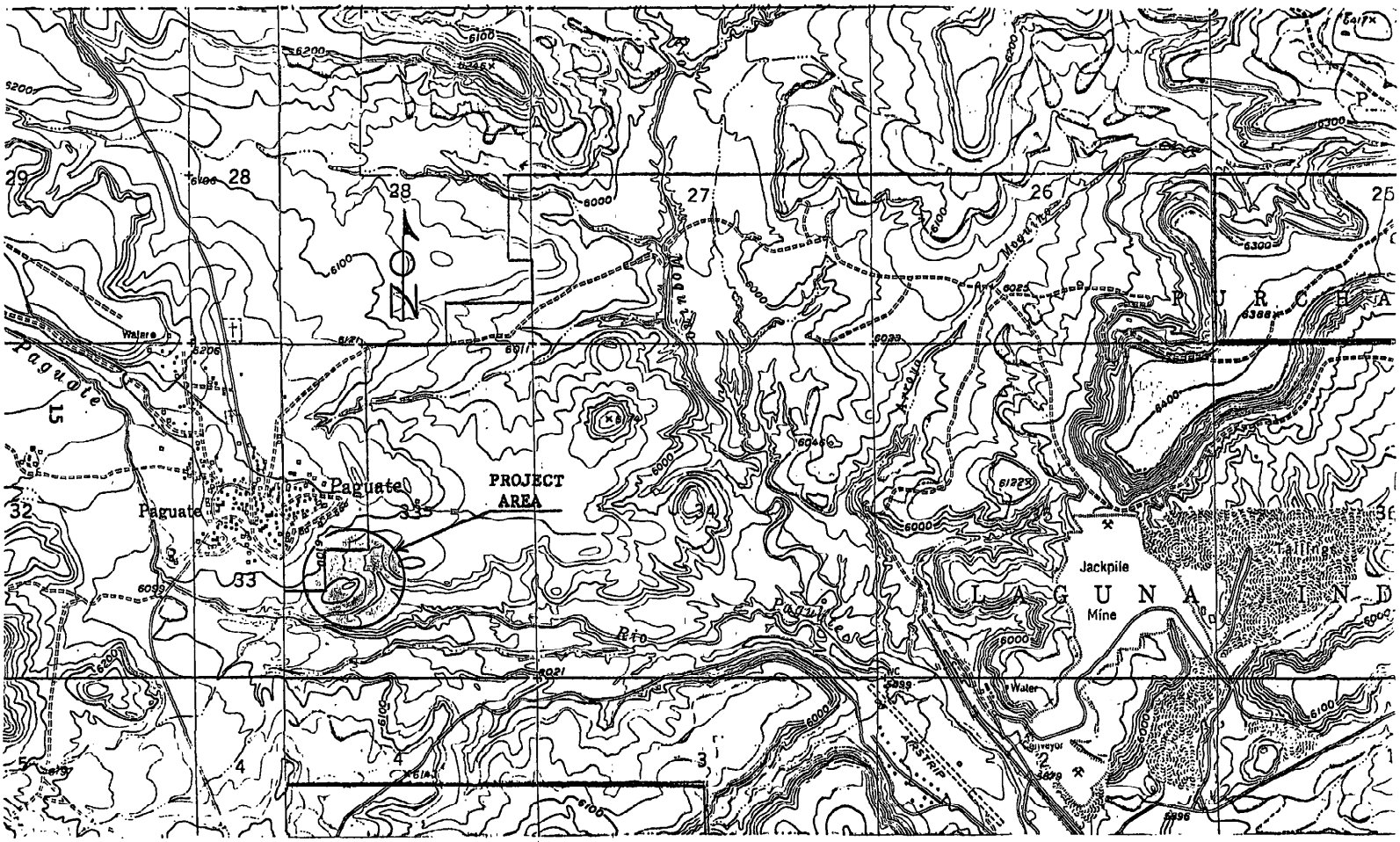
The proposed project site is located in an area that has been disturbed by open-pit mining. Therefore, the existing terrain consists of terraced pit benches and steeply sloping, flat-topped waste dumps. The land to the northwest slopes gently upward to State Highway 279 and the village of Paguate.

Elevations in the immediate area range from 5935 to 6075 feet above sea level. Prior to mining, the terrain was the gently rolling top of North Oak Canyon Mesa cut by minor drainages tributary to Rio Paguate (Map D).

The San Juan Basin is characterized by a sedimentary fill of marine and continental rocks several thousand feet thick and from Paleozoic to Quaternary in age. These sedimentary beds dip gently from the basin margins toward the center, and intrusive igneous rocks of Tertiary and Quaternary ages occur locally around the basin margins. The southern part of the Colorado Plateaus province, the Datil volcanic field (Map C), is characterized by an extensive covering of lavas and associated continental sedimentary rocks that total several thousands of feet in thickness (Hilpert, 1969, p. 9).

The Jackpile-Paguate Mine area is located in the southeastern part of the San Juan Basin, east of the Mount Taylor volcanic field. Rocks ranging in age from Late Triassic to Recent crop out in or near the area, and the regional dip of the beds is northward to northwestward at about 2 degrees. Minor faults and folds vary the dip locally (Dinwiddie, 1963, p. 217).

The primary host for uranium deposits in northwestern New Mexico is the Morrison Formation of Late Jurassic age. The Morrison is 400 to 800 feet thick and generally consists of mudstone (gray, maroon, buff), vari-colored claystone, and medium-to coarse-grained sandstone (gray to reddish-brown). The sandstone is arkosic and locally conglomeratic and locally contains concentrations of carbonaceous materials. The Salt Wash, Recapture, Westwater Canyon, and the Brushy Basin Members make up the Morrison Formation from base to top, but the Salt Wash Member occurs only in northwestern San Juan County (Hilpert, 1969, p. 19).



MAP D

Pre-Mining Project Area Topographic Map
(USGS 7.5 Minute Series, Moquino and Seboyeta Quads, 1957)

In the Laguna District, the Morrison Formation is composed mostly of a relatively thick Brushy Basin Member and markedly thinner Westwater Canyon and Recapture Members. It attains its maximum thickness of about 600 feet in the central part of the district from where it thins laterally. Southward it is beveled under the pre-Dakota erosion surface, and it is absent in the southern part of the district (Hilpert, 1969, p. 71-72).

The Recapture Member in the district ranges from 0 to about 100 feet in thickness with a probable average of about 25 feet. It is composed of alternating grayish-red and greenish-gray mudstone, siltstone, sandstone, and a few thin beds of limestone. The overlying Westwater Canyon Member ranges in thickness from 0 to more than 100 feet with an average of about 50 feet. It is thickest in the northern part of the district from where it thins southward, and locally it grades into the Recapture. It consists of grayish-yellow to very pale orange, fine-to-coarse-grained, friable sandstone (Hilpert, 1969, p. 71-72).

The Brushy Basin Member overlies the Westwater Canyon and makes up most of the Morrison Formation. From the central part of the district where it is more than 300 feet thick, it thins laterally most markedly southward and is cut out in the southern part of the district under the pre-Dakota erosion surface. It is composed of grayish-green bentonitic mudstone and some sparse thin beds of clay-rich sandstone. In the lower part it contains sandstone lenses similar to the Westwater Canyon which are generally less than 20 feet thick but locally as much as 85 feet thick. In the central part of the district, the Brushy Basin contains, in its upper part, the Jackpile sandstone which is the main ore-bearing unit (Hilpert, 1969, p. 71-72).

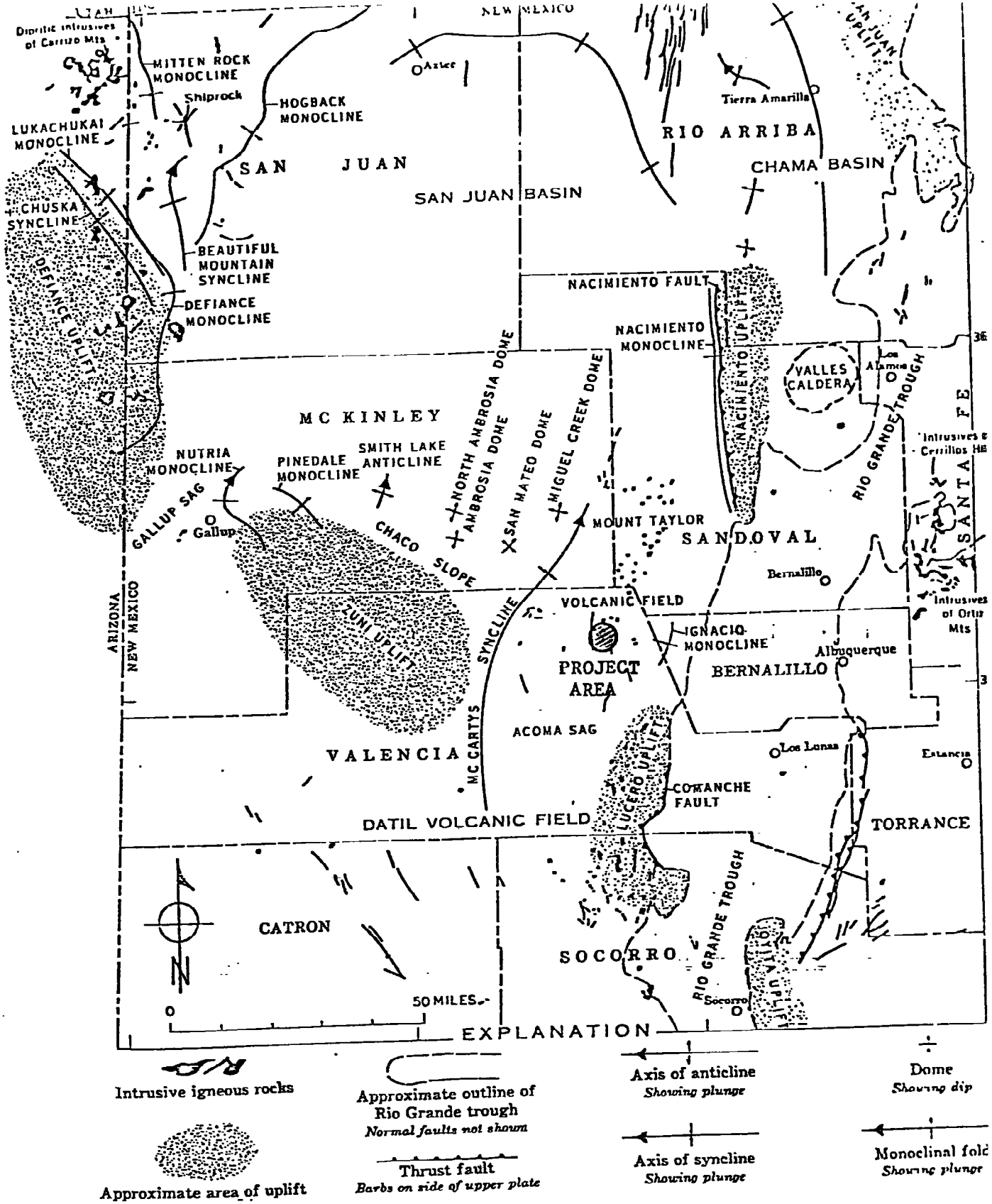
The Jackpile sandstone contains nearly all the known deposits in the Brushy Basin Member. It is a tabular body about 15 miles wide by 35 miles long extending from the vicinity of Laguna to the vicinity of Mesa Prieta. It has a maximum thickness of about 200 feet a few miles north of Laguna from where it tapers to its margins and, to the northeast, splits into two fingers. The Jackpile consists of a yellowish-gray to white, friable, fine- to medium-grained, fluvial sandstone that generally grades from coarser-grained subarkosic material at the base to finer material at the top (Hilpert, 1969, p. 71-72).

Rudy Forham, Chief Geologist for Anaconda, supplied the following geologic section for the P-9-2 area. It was obtained from drill hole data and should be applicable to the PW2-PW3 area about one mile to the north (Map B).

0	- 90-feet	-	alternating bands of shale
90	- 96-feet	-	oxidized and highly siliceous sandstone
96	- 256-feet	-	flat-lying, yellowish-grey, medium-grained alluvial sandstone; with massive interbedded sandstone in the upper one-third of the unit.

More detailed geologic information is given in the reports in Appendix IV. Two of these reports concern the P-9-2 area but should apply to the PW2-PW3 area also.

The Laguna District is located mainly on the east limb of the McCarty's syncline which dips gently northwestward into the San Juan Basin (Map E). On the east side of the district the beds are downdropped along the north-trending, faulted Ignacio Monocline into the Rio Grande trough, and the volcanic rocks of Mount Taylor cover the western side of the district. Numerous volcanic centers, flows, dikes, and sills are located throughout



MAP E.

Structural Elements in Northwestern New Mexico
(Hilpert, 1969, p. 27)

the district and mark the northern part of the Datil volcanic field (Hilpert, 1969, p. 72).

Three periods of tectonic activity are generally recognized. Jurassic deformation resulted in two sets of low amplitude folds, one trending east to northeast and one trending north-northwest. This folding was accompanied by slumping and internal faulting of unconsolidated clastic sediments and by the formation of peculiar cylindrical subsidence structures or sandstone pipes. The folding also influenced sedimentation. Late Cretaceous to middle Tertiary deformation caused the tilting of the beds to the northwest. The third period of activity occurred from middle to late Tertiary time and possibly extended into Quaternary time. This period marked the subsidence and sedimentation of the Rio Grande trough and produced the north-trending normal faults, the faulted monocline along the west border of the trough, and the joints in the sedimentary rocks. The fracturing was accompanied by the emplacement of numerous dikes and sills (Hilpert, 1969, p. 72).

In the Laguna District, the largest uranium deposits are in the Jackpile sandstone unit of the Brushy Basin Member. The deposits may be composed of one or more semitabular ore layers that range from almost equidimensional to strongly elongate in plan view. The layers are figuratively suspended within the host sandstone (Moench, 1963, p. 159), and they range in thickness from only a few inches to as much as 20 feet and occur in multiple units that are as much as 50 feet thick. The deposits' lateral dimensions range from a few feet to several thousand feet (Hilpert, 1969, p. 74). The principal ore minerals of the relatively unoxidized parts of deposits are coffinite and uraninite which are intimately mixed with carbonaceous matter (Moench, 1963, p. 159).

As previously mentioned, the PW2-PW3 ore deposits contain approximately 36,500 tons of ore in-place with an average grade of about 0.27% U_3O_8. Surface drilling indicates ore grades ranging from 0.03 to 0.80% U_3O_8. The deposits have an average depth of about 150 feet and vary in thickness from 6 to 11.5 feet (see mining plan map in Appendix I).

As noted in the geologic reports in Appendix IV, the mining property is valuable for oil and gas, but the nearest production is about 50 miles to the north. No oil wells of record have been drilled in the area. Also, although coal may occur at depth in the Cretaceous Dakota Formation, the land is not valuable for coal. Selenium, molybdenum and vanadium occur in association with the uranium deposits but are not present in commerical quantities (Dames & Moore, 1976, p. 2.3-5).

Landslides, avalanches and/or mudslides have not occurred in the mining area since operations began in 1953. Severe thunderstorms have caused several flash floods in the dry washes in the open-pit area, but they have never endangered open-pit employees (Dames & Moore, 1976, p. 2.3-7).

Data assembled for the P-15 and P-17 environmental analysis indicates that the mining area has a low seismic risk. An earthquake with a magnitude of 5 is possible in the Grants area about 30 airline miles to the west, but it would probably have a negligible effect on the project area. The Rio Grande rift, a prominent chain of structural depressions that extends southward from south-central Colorado through New Mexico, is about 35 miles (minimum) southeast of the proposed project area. Investigations have concluded that the portion of this structure extending from Albuquerque to Socorro has the highest seismic risk, and it is estimated that the largest shock along this structure in a 100 year period would have a magnitude of 6. A magnitude 6 shock at a

distance of 35 miles would probably not have a significant effect on the project area (NMEI, 1974, p. 91).

Subsidence of the strata overlying the underground mine workings would not be excessive, if any at all, depending on certain combinations of ore depth and thickness, mining extraction, and strength of the overlying strata. After the extraction of smaller deposits in most uranium mines in the districts, caving over the mined out areas stops when the increased volume of the caved rock fills the void. In addition, caving of the less competent sandstone frequently ceases upon reaching a stronger layer of indurated shale within a vertical distance of less than 30 feet.

If there was any surface expression of subsidence, most if would occur inside the open-pit perimeter and would probably be completely covered by subsequent backfilling or grading conducted in conjunction with reclamation activities. According to the mining plan map in Appendix I, State Highway 279 passes within 50 feet of one northwest ore zone. At this location, the ore has an apparent thickness of about 6 to 9 feet at a depth of about 121 feet. Surface expression of subsidence at this point is doubtful; however, it would be advisable for the lessee to establish a limited monitoring system in this area in order to detect, and thereby prevent, any subsidence that could damage the highway.

The faces of the open-pit benches are occasionally loose and incompetent due to overburden blasting and therefore have a tendency to sluff. This should not be a problem at the adit or ventilation break-through portals since adequate scaling and ground support would be implemented. However, in the areas where the underground workings would break through the bench face, this could pose a safety hazard to surface employees due to the increased weakness of the bench face. These areas

should be adequately marked or fenced to prevent entry. Underground personnel would be protected by adequate ground support and the retreat method of mining.

After the mine openings were sealed and abandoned, some natural caving at the portals would be expected (Photo D). This would not be significant since these areas would later be covered by backfilling operations.

B. Atmosphere

The climate of most of the Laguna District is semiarid. During the summers, the days are generally hot, but the dry atmosphere and almost continual breeze prevent the high temperatures from being unpleasant. The summer nights are invariably cool. The winters are moderately cold with freezing temperatures prevailing during the winter nights. Generally, the winter days are comparatively warm and pleasant (Hunt, 1936, p. 37). Day - night temperature differences are much greater in New Mexico than they are in humid areas, with most weather stations showing an average diurnal variation of from 30° to 40°F (NMEI, 1974, p. 38). Mean annual temperatures for New Mexico stations decrease about 5°F for every 1000 feet of elevation increase (NMEI, 1974, p. 40).

The mean yearly temperature for the Jackpile-Paguate area is about 53°F (Mudgett, P-10, 1975, p. 5). Based on 26 years of records for San Fidel which is about 11 miles west of Laguna, freezing temperatures (32°F and below) do not occur during May to October (NMEI, 1974, p. 40). In 1975, the maximum and minimum temperatures at Laguna were 95°F and -4°F respectively (White, 1976, oral communication).

The annual precipitation in the Jackpile-Paguate area ranges from 4 to 18 inches (Mudgett, P-10, 1975, p. 4) with an average of just under 10 inches (Gregg, 1976, oral communication). Showers usually occur in May with harder,

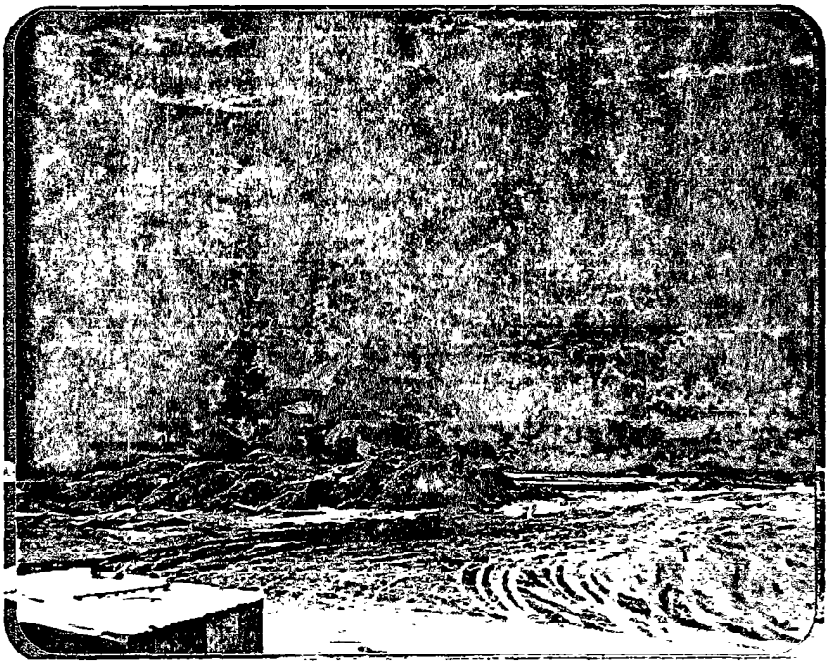


Photo D

Natural caving at the original P-9-2 portal after sealing and abandonment

downpour type rains in the middle summer months (July-August) and early fall being common (The Anaconda Company, 1973, p. 8). A steep precipitation gradient exists in the area as Mount Taylor receives about 30 inches of annual rainfall (Gregg, 1976, oral communication).

Central New Mexico receives about 75% of the available winter sunshine and about 80% of the possible summer sunshine. The annual average for Albuquerque is 77%. Similar figures should apply to the proposed mining area, but the amount of sunshine is decreased on the slopes of Mount Taylor by cumulus cloud build-up during the summer months (NMEI, 1974, p. 40-41).

Relative humidity in New Mexico is generally low. It remains below 20% much of the time, and readings to 4% have been recorded. The large diurnal variations in temperature cause a large difference in maximum and minimum relative humidities (NMEI, 1974, p. 41).

There are no air-circulation data for the proposed mining area, but a 4-year summary of the winds at the Langmuir Laboratory about 17 miles southwest of Socorro (Map A) (elevation 10,630 feet MSL) may be useful for some purposes and is presented below. It should be noted that air circulation patterns in northwestern New Mexico are governed by the local topography and the daily surface heating regime (NMEI, 1974, p. 41-45).

Four year summary of wind directions and speed at the Langmuir Laboratory, Socorro, New Mexico (NMEI, 1974, p. 44).

Season	Mean Direction	Mean Speed (mph)
Spring	West-southwest	8
Summer	South-southwest	6
Fall	Southwest	9
Winter	West-northwest	11

Severe weather occurrences are uncommon in the Jackpile-Paguate area although flash floods and severe water run-offs which result in considerable erosion are usual experiences in the July-August period when there is significant precipitation. Summer thunderstorms are occasionally accompanied by high winds and small hail (1/2-inch diameter or smaller), but large hail (larger than 3/4-inch diameter) is infrequent. Heavy snows (defined by the National Weather Service as 4 inches in 12 hours or 6 inches in 24 hours at lower elevations) may occur six to twelve times per year. Tornadoes in the area would be rare but not impossible (White, 1976, oral communication).

The proposed mining operations should have no effects on the meteorological conditions in the area, nor vice versa.

2. Air Quality

Particulate data for the Paguate area collected by the New Mexico EIA in 1975 indicate an annual geometric mean of 36.8 ug/m^3 for total suspended particulate matter. This is well below the maximum allowable concentration of 60 ug/m^3 under the EIA standards and 75 ug/m^3 under Federal standards (Rinaldi, 1976, written communication).

The proposed mining operations should have no significant adverse effects on the air quality in the area. Actually, underground mining of the ore would create less air contamination than open-pit methods. However, a certain amount of dust would be created by site preparation, by vehicular traffic on the access and haulage roads, and by reclamation operations. This dust would be only temporary, and problems could be avoided or minimized by applying adequate amounts of water to excessively dust areas and roads.

The ore storage pad should not be a significant source of dust due to the large size of the smallest run-of-mine particles and the natural dampness of the material. High winds could cause a small amount of airborne dust, but most of it should settle within a short distance because of the fairly heavy particle weight. Furthermore, the ore stockpile would be quite small (1 or 2 days production maximum), and the waste rock would be used to level the storage pad and would therefore be compacted to a certain degree. The loading and unloading of ore and waste material should not create any appreciable amount of dust.

Air pollution from the exhaust gases of surface equipment (loaders, haulage trucks, etc.) should be insignificant due to the small amount of equipment required and the use of appropriate pollution control devices.

Dust problems in the mine should not be significant due to the natural moisture in the mine environment and should have no effect on the surface atmosphere. Contamination of the mine atmosphere by fumes from the detonation of explosives, radon gas from radium disintegration, and exhaust gases from approved diesel equipment would be maintained within acceptable limits by the mine ventilation system. Frequent monitoring by authorized mine personnel, inspectors, and the New Mexico State Mine Inspector would assure compliance with the applicable regulatory standards and would provide the basis for any required changes in the ventilation system.

The contaminated mine air exhausted through the ventilation breakthroughs (heated air and some fine particulates) would be rapidly dissipated in the ambient surface atmosphere without adverse environmental effects. The 1971 and 1972 analyses of large ambient surface air samples by the Kerr-McGee Corporation at its uranium mines in the Ambrosia Lake district indicated no radiological contamination over the natural background

count (0.15 working levels concentration) within a 150-foot radius of the borehole exhaust vent and a very low level of concentration at a distance of 25 feet. Similar results from parallel testing during the same time period were obtained by Edward P. Kaufman, Program Manager, Radiation Protection, New Mexico EIA (Cleveland, 1975, oral communication).

The evaporation of the mine water in the retention ponds could create a local high moisture anomaly in the air. This should not have a significant adverse effect on the environment but could, in fact, be beneficial to the local vegetation.

The Anaconda Company has established a high volume air sampling station and currently monitors ambient air concentrations on a continuous basis. According to the company, the particulate levels have been well below the regulatory standards. The company plans to expand the program by establishing meteorology monitoring stations and by locating additional air sampling stations at strategic locations (The Anaconda Company, 1973, p. 10).

Noise created by the proposed operation should not be a significant problem. The closest residences are in Paguate about 1000 feet to the northwest. The majority of the noise creating functions would be conducted underground and therefore would not affect the surface. This noise would be maintained within acceptable limits as prescribed by MESA and the New Mexico State Mine Inspector by the use of recommended muffling devices on mining equipment and the use of hearing protection by mine personnel. The major sources of surface noise would be the ore loading and haulage equipment and ventilation fans located outside the mine workings. Noise from the small amount of loading and haulage equipment would be intermittent, and any surface fans should be much smaller than those used in deeper underground operations. The proposed mining operation should create considerably less noise than open-pit mining methods.

C. Hydrology

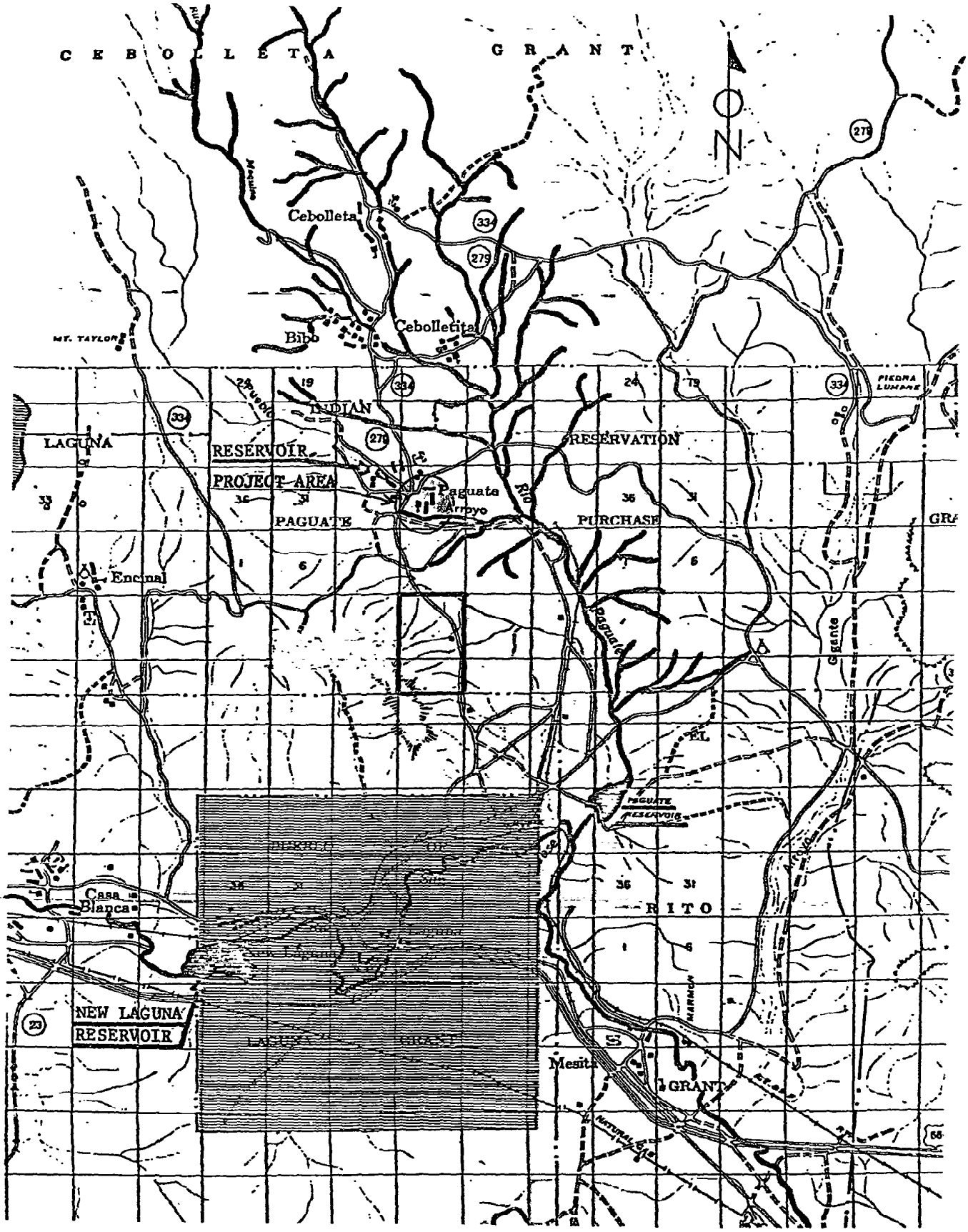
1. Surface Water

The main stream in the Laguna District is the perennial Rio San Jose (Map F) which is entrenched 20 feet or more over most of its length. It drops from an altitude of about 5,900 feet to less than 5,600 feet from west to east and joins the Rio Puerco, a tributary of the Rio Grande, a few miles southeast of the district. The Rio Puerco drains the west flank of the Nacimiento Mountains but flows continuously only during the wet season (Moench and Schlee, 1967, p. 4).

The Rio San Jose is joined by several arroyos from the north and south, but the majority of these flow only after heavy precipitation. The largest such arroyos are the perennial Rio Paguate and the intermittent Arroyo Conchas which drain the area to the north and the Arroyo Colorado which drains the broad valley to the south. All the main streams and tributaries are entrenched into arroyos cut in the alluvial fill of the valleys. The arroyos carry large quantities of water immediately after heavy precipitation and occasionally the waters rise over the banks and spread out as sheet floods (Hunt, 1936, p. 4).

In the mining lease area, the main streams are the Rio Paguate and Rio Moquino. These so-called perennial streams are sustained by springs that issue from mesas northwest of Paguate (Dinwiddie, 1963, p. 218), and they join in the Jackpile Paguate mine area to form the Rio Paguate which flows into the Paguate Reservoir and hence into the Rio San Jose.

The main bodies of ponded water in the area are the Paguate Reservoir, the New Laguna Reservoir and a small unnamed reservoir in the village of Paguate (Map F). The Paguate Reservoir is about 5 miles southeast of the project area and retains the flow of the Rio Paguate about one-half mile



MAP F

Surface Water Sources
Scale: ½"=1 mile
(Bureau of Land Management Color Quad Map, 1975, Cubero Quad)

northeast of its intersection with the Rio San Jose. The New Laguna Reservoir is located on the Rio San Jose about 8 miles southwest of the project area. The small reservoir in Paguate retains the flow of some small streams flowing from mesas to the northwest. There are numerous small, natural or man-made water catchments outside the proposed mining area, but these probably hold water only intermittently due to evaporation and seepage.

At the present time, no major use is made of the surface waters in the area. At some time in the past, the water in Paguate Reservoir was used for irrigation purposes, but this reservoir, and the New Laguna Reservoir, are currently nonfunctioning due to sediment filling.

Since the PW2-PW3 area has been disturbed by mining, previous surface drainage has been significantly altered or altogether removed. Surface water in the immediate area is now ground water seeping from the bench faces and some runoff from snowmelt, all of which is ponded in the pit bottom. Prior to site preparation, this water would be pumped to the previously mentioned retention ponds. The proposed project would have no effect on surface waters, and the drainage patterns in the area would again be altered upon completion of reclamation.

2. Ground Water

The principal aquifers in the Jackpile-Paguate minesite area are the alluvium along the Rio Paguate, the Tres Hermanos Sandstone Member of the Mancos Shale in the western part of the area, and the sandstone beds of the Brushy Basin and Westwater Canyon Members of the Morrison Formation throughout the area (Dinwiddie, 1963, p. 217).

Quaternary alluvium is exposed along the Rio Paguate and the tributary Rio Moquino. Although the alluvium along the Rio Moquino and the lower part of the Rio Paguate is not used as an aquifer because of the water's

high dissolved solids content, the water in the alluvium along the upper part of the Rio Paguate is potable. Wells drilled west of Paguate to test the quality and quantity of this water showed that the water was suitable for domestic use and that yields of 10 to 35 gallons per minute (gpm) could be sustained. In one well, water in the lower part of the alluvium was under artesian pressure and flowed at a rate of 13 gpm (Dinwiddie, 1963, p. 218).

The sandstones in the Tres Hermanos Sandstone Member are the only units of the Mancos Shale that yield potable water, generally yielding from 5 to 20 gpm. Although larger yields have been reported, yields greater than 20 gpm would not be expected in the area (Dinwiddie, 1963, p. 217-218).

The Westwater Canyon Member of the Morrison Formation yields a small amount of potable water, between 8 to 10 gpm, to a few wells in the area. The sandstone beds of the Brushy Basin Member reportedly yield as much as 20 gpm of water east of the area, but this water has a rather high dissolved solids content. The Jackpile unit of the Brushy Basin is not considered to be a good aquifer although it reportedly yields from 8 to 10 gpm of water to one well in the area (Dinwiddie, 1963, p.217).

The Quaternary alluvium aquifer is recharged by runoff which infiltrates to the west and north. The Brushy Basin and Westwater Canyon aquifers crop out in the valleys and the Tres Hermanos aquifers crop out extensively in the area; recharge of these aquifers is probably limited to precipitation on and runoff over the outcrops (Dinwiddie, 1963, p. 217-218). It is doubtful that there is significant communication between aquifers, and there are no known natural discharges for the aquifers in the area.

There are numerous wells in the Jackpile-Paguate area which supply water for domestic and industrial use. The Paguate municipal water supply

is a flowing artesian well completed in the alluvium along the Rio Paguate at a depth of about 75 feet. Three other wells in the area, believed to be former uranium exploration drill holes equipped as water wells, are the property of The Anaconda Company and are used to supply potable water as well as water for equipment washing, etc. (EPA, 1975, p. 57-58). One of these wells supplies domestic water for the Jackpile Mine offices and the mine housing area from the Jackpile sandstone at a rate of about 35 gpm. The P-10 Mine well is completed in the Brushy Basin Member to a depth of 465 feet and yields about 35 gpm for the mine's surface and underground uses (Mudgett, P-10, 1975, p. 10-11).

The proposed mining operation should have very little effect on the ground water resources of the area as noted in the hydrologist's memorandum report in Appendix V. Although, mining would require the withdrawal of water from the Brushy Basin aquifer, it is doubtful that the amount withdrawn would be significantly greater than the quantity presently seeping into the pit. Water for potable and service uses would be transported to the site in portable containers and/or piped to the site from existing sources, precluding the need for completing an additional well in the area.

The proposed method of mine water disposal is suitable, as noted in the hydrologist's report. Any leak in, or rupture of, the pipeline to the retention ponds would be confined to the pit thereby minimizing any environmental impacts.

Aquifers in the area should not be disturbed significantly by subsidence of the strata overlying the mining voids because such subsidence, if any, should not be excessive (see Section II. A.).

3. Water Quality

Water quality data for the surface waters in the Jackpile-Paguate area are scarce. According to a study conducted by the U. S. Environmental Protection Agency (EPA) in 1975, stream samples taken from the Rio Paguate and the Rio Moquino showed a definite increase in Radium-226 (Ra^{226}) and selenium concentrations downstream from the Jackpile mining operation indicating that precipitation runoff from the disturbed land surface adds radiochemical bearing solids to these streams. However, it should be noted that only one sample was taken at each location, and that the radium concentrations were less than 5 pCi/l which is less than the State of New Mexico's present standard of 30 pCi/l. Furthermore, the selenium concentrations of the Paguate Reservoir and the Rio San Jose were less than detection limits (EPA, 1975, p. 31, 33, 35).

The proposed action would have very little effect, if any, on surface water quality due to the absence of any major surface water sources in the proposed mining area. Any surface runoff entering or generated within the mining area would be confined to the open-pit.

Water quality data collected for the P-15 and P-17 environmental analysis indicated that the ground water quality in the Jackpile-Paguate area is generally good. During the EPA study conducted in 1975, four wells in the vicinity of the Jackpile-Paguate open-pit mining operations were sampled with concentrations of Ra^{226} ranging from 0.18 to 3.7 pCi/l. The lowest value (p.18 pCi/l) was recorded at the Paguate municipal water well. The other wells, believed to be former uranium exploration holes equipped as water wells, are the property of The Anaconda Company and are used to supply potable water and water for equipment washing, etc. The quality of the water from these three wells is probably representative of the Jackpile

Sandstone but the water may contain elevated levels of radium due to uranium mining activities. The high value of 3.7 pCi/l exceeds the U. S. Public Health Service Drinking Water Standard of 3 pCi/l and was recorded at the Jackpile New Shop Well which is a source of potable and nonpotable water. The EPA subsequently recommended that the continued consumptive use of this water be stopped (EPA, 1975, p. 57). Further sampling by Anaconda, however, indicates an Ra^{226} concentration of 1.0 pCi/l in the water from this well.

None of the wells sampled by the EPA were above the maximum permissable concentrations for the other common isotopes of uranium, thorium and polonium (EPA, 1975, p. 6), but the Paguate water supply contained the maximum recommended level for selenium (0.01 mg/l)(EPA, 1975, p. 59). Although the EPA noted that the impacts of mining on ground water quality downgradient from the mining operations were unknown due to the lack of adequate monitoring wells, it also stated "No adverse impacts from mining on the present water supply source for Paguate are expected." (EPA, 1975, p. 6).

Ground water seeping into the PW2-PW3 mine workings would become radioactively contaminated because the primary minerals to be mined would be exposed to the oxidizing conditions created by excavation. Leaching of the very low grade mineralization remaining in the rocks surrounding the mined out areas would also occur. Both of these conditions would result in the mine's discharge water having radioactive concentrations possibly greater than recommended limits. Mine discharge water impounded within the Paguate Pit contained 190 pCi/l of radium and 170 pCi/l of uranium in 1970 (EPA, 1975, p. 6). This radiological contamination would require that the mine's discharge water be impounded in the retention ponds for subsequent evaporation of the liquid portion. It is anticipated that the initial flow

of ground water into the mine workings would be at a rate of about 30 to 50 gpm, decreasing to about 10 to 15 gpm as mining progressed. This small amount of water would be impounded as previously discussed; no water pumped from the mine workings would be discharged off the property.

Following the termination of mining operations in the PW2-PW3 area, ground water accumulating in the voids created by mining would also become radiologically contaminated. However, the impervious nature of the shales above and below the Jackpile sandstone unit should prohibit substantial vertical migration of this water, and typical changes in the lithologic character of the unit should tend to restrict and localize lateral migration (Mudgett, P-10, 1975, p. 12).

The radioactive contamination of ground water in the proposed mining area should not be a major adverse impact due to the small amount of water that would probably be encountered.

D. Land Use

All of The Anaconda Company's leases are used for mining purposes except for a small centrally located housing area for about thirty key mine personnel. This area is on Lease 1, well removed from the surface mining activities. The property is posted and fenced at all points of easy access, and a security guard station on the principal access road is manned 24 hours a day (Mudgett, P-10, 1975, p. 5). There are no residences in the proposed mining area.

The lands adjacent to The Anaconda Company's mining leases are used exclusively by members of the Laguna Tribe for residential and livestock grazing purposes. The primary domestic animals encountered are sheep and cattle, but a few horses do roam in the areas. Agriculture is severely limited by the lack of sufficient precipitation and is probably restricted to small garden plots worked by residents of the areas.

The community closest to the proposed mining area is the small Laguna Indian village of Paguate (Map A) which is about 1000 feet to the northwest. As of January 1, 1975, the census showed a resident and non-resident population of 1,383 for Paguate (Starcevich, 1976, oral communication); however, the actual resident population for the village is close to 300 (The Anaconda Company, 1973, p. 9). Paguate has no retail or public service facilities such as restaurants, service stations, motels, schools, hospitals, etc., except for one very small general merchandise type store which is extremely limited in available goods. Approximately 2 to 5 miles north of Paguate are the even smaller settlements of Bibo, Cebolleta, Cebolletita, and Moquino.

The Indian village of Laguna, or the Pueblo of Laguna, is located about 5 miles south of the proposed mining area (Map A). This small village, as of January 1, 1975, had a resident and non-resident population of 1,449 although, as in the case of Paguate, the actual resident population is probably much less. There are more services here than in Paguate but they are still limited to a few small stores and service stations. The Laguna-Acoma High School and an elementary school are located in Laguna (Starcevich, 1976, oral communication).

Access to the Paguate area is provided by paved State Highway 279 which joins Interstate Highway 40 at Laguna (Map A). I-40 connects Laguna with Grants-Milan to the west and Albuquerque to the east. Greyhound Bus Lines, Inc., and Continental Trailways, Inc., stop daily for passengers in Grants on their routes from Albuquerque to Los Angeles, California. Passenger and freight rail service is provided by the ATSF railroad which also passes through Grants-Milan and Albuquerque. Albuquerque has the closest commercial air service (NMEI, 1974, p.20).

Recreation in the Paguate-Laguna area is confined primarily to outdoor activities such as picnicking, camping, sight-seeing, and hunting, the majority of which are conducted in the Cibola National Forest on, and to the west of, Mount Taylor. These activities can be classified as seasonal and intense (NMEI, 1974, p. 16, 34). Camping, fishing, boating, and swimming are permitted at Bluewater State Park (Bluewater Lake) which is about 21 miles west of Grants via State Highway 412. The major recreational centers in the area are Grants and Albuquerque.

Due to their size, nature, and location, the proposed mining operations would not have any effects on land use in the surrounding areas. No impacts on the local transportation services would be expected since ore shipment would be by company equipment and existing rail facilities and schedules.

There are no historical or archaeological sites in the proposed mining area. Two archaeological surveys were conducted for Anaconda's comprehensive mining plan, and Appendix VI contains the portion of one of these reports that dexcribes the findings in the PW2-PW3 area. Copies of these reports have been submitted to the Bureau of Indian Affairs archaeologist in Albuquerque so that formal archaeological clearance may be obtained.

The Laguna Pueblo and the San Jose de la Laguna Mission and Convento (in the Pueblo) at Laguna are listed in the National Register of Historic Places, but both are well removed from the proposed operations (about 5 miles) and would not be affected. The Grants Lava Flow which extends about 25 miles south of Grants between State Highway 117 on the East and 53 on the west (Map A) is eligible for listing in the National Registry of Natural Landmarks, but it too is well removed from the proposed project.

The proposed action would not affect the scenic or aesthetic values of any of the prominent landmarks in the area such as Mount Taylor, the Laguna

Pueblo, Mesa Chivato, and the Cibola National Forest. In fact, the operations would not be easily visible due to their location in the bottom of the Paguate Pit. Completion of the PW2-PW3 operations would improve the aesthetics in the area by allowing the backfilling and reseeding of this portion of the mined-out pit.

The reclamation potential of the land in the area has not been adequately determined, but the writer feels that this potential is only poor to fair. This estimate is due to the fact that most uranium related reclamation work (primarily in uranium exploration) has met with only limited success due to soil characteristics and the lack of sufficient moisture (precipitation). These conditions would also surely determine the results of any revegetation programs in the Jackpile-Paguate area.

The Anaconda Company is currently conducting revegetation experiments on inactive waste dumps in order to adequately assess the land reclamation potential. The U. S. Conservation Service has recommended such seed mixtures as sideoats, gramma grass, western wheatgrass, and chamisa brush, and test plots have been planted for observation (The Anaconda Company, 1973, p. 7). Continued experimentation by Anaconda and other companies in northwestern New Mexico's coal and uranium industries should improve the land's reclamation potential by providing new and improved reclamation techniques.

E. Fauna and Flora

Due to past mining activities, it is highly doubtful that any wildlife inhabit the proposed mining area. It is possible that some birds, insects, rodents, and/or reptiles might pass through the area briefly, but mining operations should not have any significant effects on these transients. The mining area is already fenced to prevent livestock intrusion.

Wildlife in the surrounding area is limited to small rodents (rabbits, mice), small predators (foxes, coyotes, bobcats), small birds (finches, sparrows, jays), insects, and reptiles common to northwestern New Mexico. The presence of a stable, resident predator population is doubtful because of human presence and activity, and most of the birds are also probably transient inhabitants. The largest wild animal in or near the area are mule deer which inhabit the slopes of Mount Taylor and the mesas to the north (The Anaconda Company, 1973, p. 9). No endangered species are known to be present in the area as residents (Mudgett, P-10, 1975, p. 6). The proposed action would have no effect on wildlife in the surrounding area.

The vegetation in the lowest valley and mesa areas around Mount Taylor is characteristic of Upper Sonoran life zone consisting of flowers, grasses, sagebrush, and composites such as goldenrod, rabbitbrush, and sunflowers. The trees in this zone generally occur on hillsides and mesas and consist of one-seeded juniper, the nut pine (piñon), and the cane cactus. Greasewood is common on alluvial flats adjacent to watercourses, and there are groups of the common valley cottonwood (Hunt, 1936, p. 37).

Past open-pit mining has removed all vegetation from the surface area that would be affected by the proposed mine. The area between the existing pit crest and Highway 279 is sparsely covered by a combination of grasses and sagebrush and possibly greasewood, and the proposed operations should not affect this vegetation.

Successful reclamation of the mining area would be beneficial to both fauna and flora species. It would also provide additional grazing habitat for livestock.

F. Socio-Economic Conditions

The proposed operations should not cause a large influx of new people into the area since Anaconda would use local labor as much as possible. In compliance with lease terms, Anaconda gives the Laguna Indians priority in employment at all its Jackpile-Paguate mining operations, and, as of October 1975, about 90% of the company's 372 mine personnel were Lagunas (Mudgett, P-10, 1975, p. 5). It is anticipated that a maximum of twelve new employees would be required by the PW2-PW3 Mine (Nelson, 1977, oral communication). This would result in only minor, if any, socio-economic impacts.

Any socio-economic impacts on the villages of Paguate and Laguna should be very minor due to the very limited supply of services available in these communities. Some Lagunas employed at the mine could want to relocate in Laguna or Paguate which could require additional housing, but this should not be of major consequence. The Anaconda Company has cooperated with the Laguna Tribe in housing construction in Paguate.

The most significant socio-economic impact resulting from the proposed action would be the generation of new income. According to lease terms, the company would pay royalties on the ore mined to the Pueblo of Laguna; as of November 1973, the Jackpile-Paguate mining operations had paid about $25,000,000 in such royalties to the Pueblo (The Anaconda Company, 1973, p. 3). Direct employment during the mine's live would also result in annual disposable income. It is expected that most of this income would be respent within the region which could have a multiplier effect on other sectors of the economy. Additional federal, state, and local taxes that would be paid by Anaconda and its employees should offset any increased governmental costs that would be caused by the proposed action.

Increased income in the area could improve the standard of living for a few families, and direct employment could improve the self-esteem and mental health of some people who are currently unemployed and underemployed. Because the Lagunas would be given preference in hiring, most of the benefits would be directly, or indirectly, advantageous to the Laguna Indian Tribe, as would the royalty benefits. Only a few (12 maximum) experienced workers would be unemployed at the close of operations, and these people should be able to find new jobs easily, possibly at the P-15 or P-17 Mines.

The proposed action should not have any significant effects on the cultural values of the area or of the Laguna Indians in particular. It seems that all Indians have the general belief that nature is a strong force to which man must adapt rather than control. Although this belief causes a reluctance to support activities exploiting the Indians' natural resources, it also provides strong support for the restoration of the land following such activities. It also seems that although Indians do value work, they work to maintain their families and themselves, not to achieve social prestige. This evidently causes a strong tendency to reject monetary incentives once a relatively low level of income is reached. Indian males evidently often reject the role of "breadwinner" since it involves accepting wage labor, thus increasing the possibility of alcoholism and social dysfunction which can result in increased absenteeism and possibly the total rejection of work. According to Anaconda officials, absenteeism among the company's Laguna employees is quite high which necessitates the hiring of extra personnel who would normally not be required (Gibbs, 1976, oral communication).

G. Health and Safety

Health and safety at the mines would be controlled by the company's safety personnel in accordance with the standards and regulations of the New

Mexico State Mine Inspector and the Mining Enforcement and Safety Administration. Periodic inspections of the operations by authorized personnel from these regulatory agencies would assure compliance with the applicable regulations and standards. The Anaconda Company currently operates active safety programs at both its mining and milling operations.

III. ALTERNATIVES TO THE PROPOSED ACTION

No other mining methods or modification of the proposed method would result in reduced environmental damage or disturbance. Open-pit mining would have a much greater environmental impact because it would require the utilization of much more land surface with the final open-pit being more difficult to backfill and reclaim. In situ leaching (solution mining) of the ore bodies, if technically feasible, would result in lower uranium extraction and possible contamination of ground water due to losses in solution recovery.

The proposed action could be refused, but this would prevent the production of source materials necessary for the generation of electricity by nuclear fission energy. This electricity is needed to alleviate the national energy shortage. Refusal of the proposal would also deprive the Pueblo of Laguna of direct and indirect benefits from potential royalty and direct employment incomes.

If the proposed action is not approved, backfilling of the mined-out pit area will be delayed which will in turn delay returning the land to its original state and use. Backfilling of the pit without prior removal of the ore through the PW2-PW3 workings would result in the waste of the natural resources since the ore deposits are not large enough to support a separate mining operation.

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

Subsidence of the strata overlying the underground mine workings could have some surface expression depending on certain combinations of ore depth and thickness, mining extraction, and strength of the overlying strata. It is expected that any subsidence occurring would not be excessive and would not create a significant adverse impact.

The proposed operations would cause a certain amount of dust, but this would not be a major impact and could be further minized by using water. Air pollution from equipment exhaust gases should be insignificant. The mine's atmosphere would be contaminated by blasting fumes, radon gas, and exhaust gases, but the ventilation system and frequent monitoring by the appropriate regulatory agencies would maintain this contamination within acceptable limits.

Any noise created by the operations would be insignificant due to the absence of any nearby residences and the small amount of equipment involved.

The extraction of the PW2-PW3 ore deposits would require the withdrawal of a small amount of ground water from the Brushy Basin or Westwater Canyon aquifers. This should not significantly affect the availability of ground water in the area. In addition, ore extraction would result in radiological contamination of the ground water seeping into the mine workings during the productive life of the mine and, to a lesser degree, following the termination of all mining operations with minor potential for migration within the Jackpile Sandstone. During the mine's life, the mine water would be impounded in the existing ponds, and no water from the mine would be discharged off the property.

EXHIBIT I

Lease Number Laguna #1 (Jackpile Lease)

Lessee (Permittee) The Anaconda Company

County Valencia State New Mexico

Date February 15, 1977

Prepared by Dale C. Jones

Other Agency Representatives Bill Clark, USGS

	PROPOSED ACTION	Affected Resources: Air Quality	Noise	Surface Water Quantity	Surface Water Quality	Ground Water Quantity	Ground Water Quality	Existing Land Use	Surrounding Land Use	Historical and Archeological Sites	Scenic, Recreational and Aesthetic Values	Endangered Species and Habitat	Plant Populations	Animal Populations	Nesting, Breeding or Migration Sites	Effect on Local Communities	Effect on Cultural Values	Public Health and Safety	Public Interest	Other
Construction	Roads, bridges, airports, railroads																			
	Transmission lines, pipelines																			
	Dams, impoundments, water diversions																			
	Structures (mine buildings, etc.)																			
	Exploration (drilling and trenching)																			
Mining	Surface excavation (surface mines, shafts, etc.)																			
	Subsurface excavation	/	/			/	/													
	Storage (product, waste, spoils, water)	/	/																	
	Mineral processing and extraction facilities																			
	Post mining activities (backfilling; reclamation, etc.)	/	/		/		/	B			B		B	B			B			
Transportation	Trucks & loading equipment	/	/																	
	Pipelines, conveyors																			
	Railroad																			
	Other																			
Waste Disposal	Solid waste (spoils, tails, waste rock)	/																		
	Sanitary wastes																			
	Liquid effluent discharge	/		/	/															
Accidents	Spills, leaks, explosions																			
	Geologic related hazards (subsidence, slope failure, etc.)					/	/		/											
	Structure failure (dams, impoundments, etc.)																			
Other																				

INSTRUCTIONS: This matrix is to be completed during the onsite examination conducted with the surface managing agency and other agencies as required in the EA Guidelines. Adverse effects on existing conditions are to be indicated as follows: ☐ No effect ☑ Minor effect ☒ Major effect
y beneficial effects are to be indicated by inserting a " " in the appropriate box. Section XIV D, "Environmenta[illegible]tion"

VI. CONFLICTS AND RESPONSES

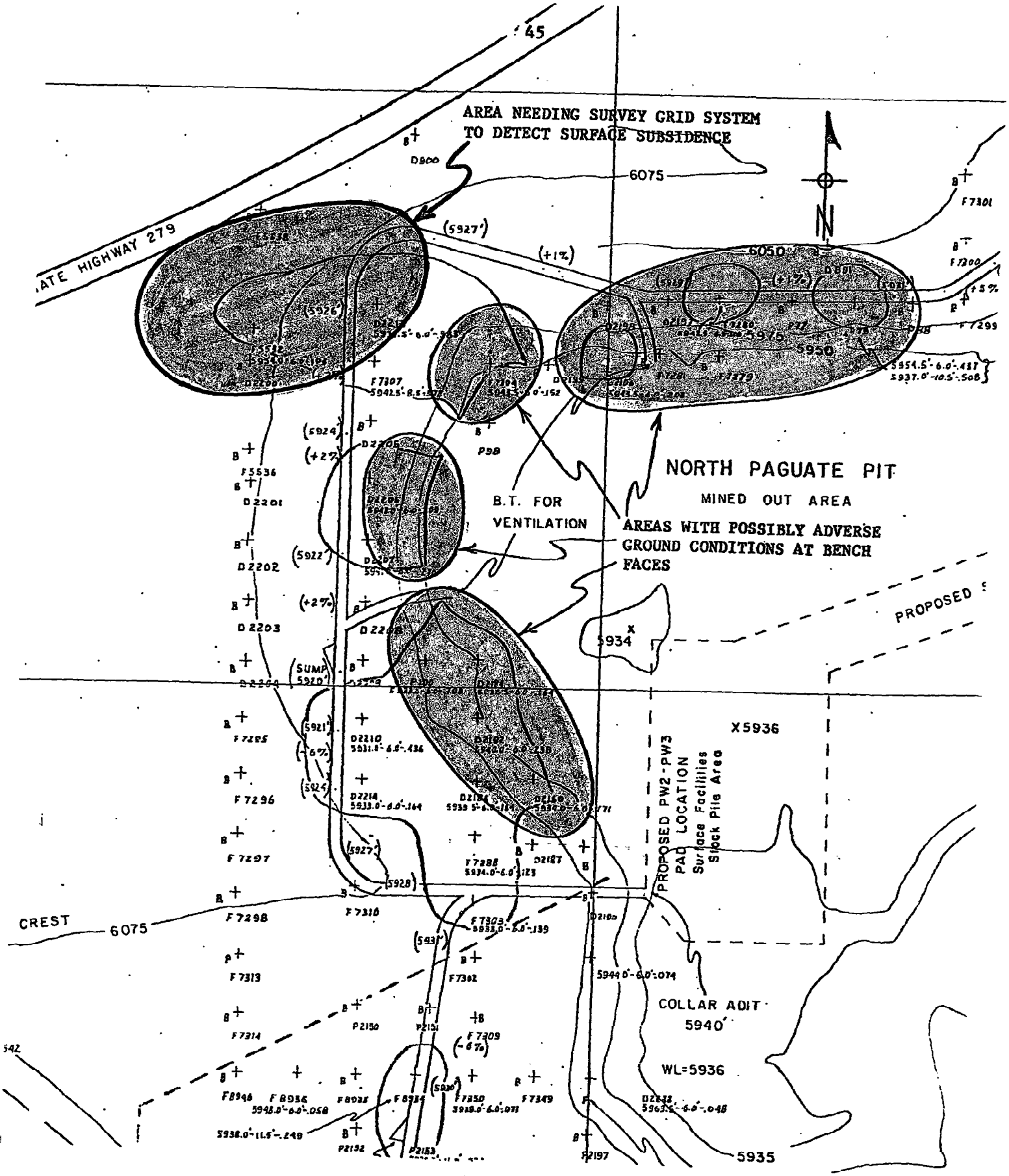
The prescribed posting of public notices of the proposed action (Appendix III) has resulted in no comments, inquiries nor evidence of controversy.

It is anticipated that the Pueblo of Laguna and the BIA will make their respective comments and/or recommendations regarding the proposed action after reviewing this analysis.

VII. RECOMMENDATIONS AND DETERMINATION

1. The Anaconda Company should establish an adequate survey grid system in the area shown on Map G to detect, and thereby prevent, any surface subsidence that would damage State Highway 279. The plan for this monitoring system should be submitted to, and approved by, the Area Mining Supervisor prior to actual ore extraction.
2. The mining operations could create and/or increase adverse ground conditions near the pit perimeter as shown on Map G. Should these conditions constitute a safety hazard, the Anaconda Company should take adequate and appropriate measures to prevent accidents in these areas.

Dale C. Jones
Mining Engineer



MAP G

Areas of Potential Surface Subsidence and Adverse Ground Conditions
Scale: 1"=100'
(The Anaconda Company, 1976)

I determine that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment in the sense of the NEPA, Section 102(2)(c), and is not highly controversial.

5/9/77
Date

David R Stewart
David R. Stewart
Deputy Mining Supervisor

I do/do not concur.

Date

A. F. Czarnowsky
Area Mining Supervisor

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APPENDICES

Appendix I

Mining and Reclamation Plan

For The

PW2-PW3 Mine Project